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INFESTATION OF TAILLESS AMPHIBIANS OF GENUS RANA BY TREMATODES IN THE VALLEY OF THE TISA RIVER (YUGOSLAVIA)

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Abstract

On a section comprising the territory of Bečej and Ečka a parasitological search has been carried out in 13 hosts of the species *Rana esculenta* and 9 individuals of the species *Rana ridibunda*. Almost the same extensity of invadedness in both species of frogs has been stated (77.8% and 76.9%), while the specimens of the species *Rana ridibunda* have shown a greater intensivity of infestation. Nine species of trematodes have been defined: *Diplodiscus subclavatus* GOETE, *Gorgodera cygnoides* ZEDER, *Haematoloechus (Pneumonoeces) variegatus* RUDOLPHI, *Haematoloechus (Pneumonoeces) schulzei* WUNDSCH, *Opisthyoglyphe ranae* FRÖLICH, *Cephalogonimus retusus* DUJARDIN, *Pleurogenoides medians* OLSSON, *Prosotocus confusus* LOOSS and *Pleurogenes claviger* RUDOLPHI.

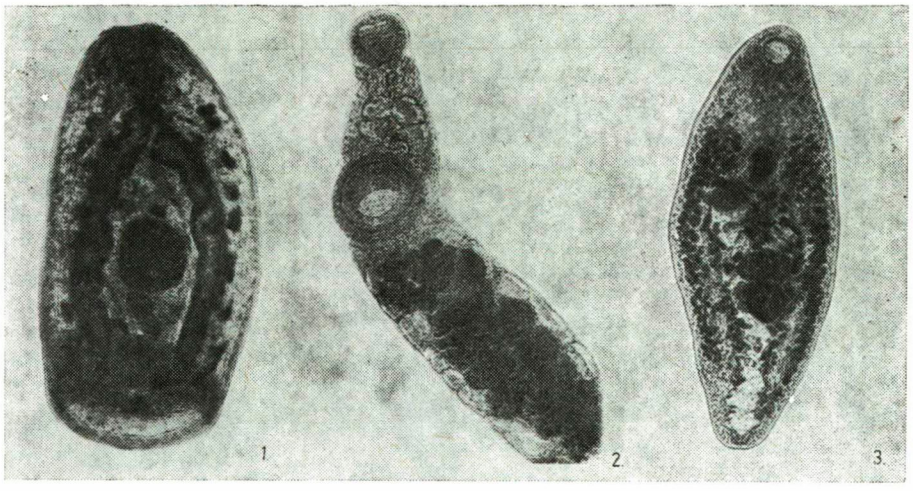

Fig. 1 — *Diplodiscus subclavatus*
Fig. 2 — *Gorgodera cygnoides*
Fig. 3 — *Opisthyoglyphe ranae*

Fig. 4 — *Cephalogonimus retusus*
Fig. 5 — *Pleurogenes claviger*
Fig. 6 — *Pleurogenoides medians*

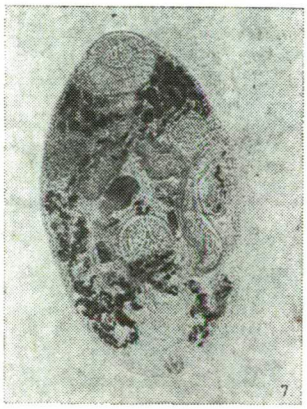

Fig. 7 — *Prosotocus confusus*

Introduction

Presently the interest for the investigation of parasitofauna has been growing constantly both with respect to their place in the systems and their spread, as well as from the ecological aspect. The basic problem in the domain of ecology is, of course, to state how the parasites develop in the interaction on the line exterior environment-parasite-host, as well as to define their role in given ecosystems, in this case, primarily in the acquatic ones. Namely due to alimentary concatenation, amphibians, particularly the hosts of endohelminths, are organically connected to a great deal with the members of marshy biocenoses, among others with many economically important species.

The investigation of helminthofauna of tetrapodes from the open air of Vojvodina (the northern part of Yugoslavia) so far has been sporadically carried out, and that of the hosts of ornitofauna (SEY et *al.* 1971; SOTI et *al.* 1972; MIKES et *al.* 1974), of terriofauna — the mouselike rodents from agrobiocenoses (MÉSZÁROS et *al.* 1983), from small mammals of the periodically inundated zone of the Tisa River (MIKES, HABIJAN, MIKES, 1986), as well as *Anura,* also from the valley of the Tisa River (MIKES, POPOVIĆ 1988). Data on helminthofauna Amphibia in Yugoslavia can be found only in works HRISTOVSKI 1968, 1974 from the territory of Macedonia, and trematodes of the small cormorant *(Phalacrocorax pygmaeus)* from the territory of the Scutari Lake have been treated by POPOVIĆ (in press).

In this paper we present the infestation of two species of hosts — the tailless amphibians from genus *Rana (R. esculenta)*-13 frogs and *R. ridibunda*-9 frogs by trematodes. Beside defining the level of the quantitative and qualitative invadedness of the hosts by certain groups of helminths, the analysis of the collected material is also concerend with the defining of the taxonomic belonging of the discovered termatodes.

Materials and Methods

The analysis of the infestation of the hosts by endohelminths has been performed on a total of 22 individuals of tailless amphibians (13 ind. *Rana esculenta* and 9 ind. *R. ridibunda*). The hosts originate from two specific localities in the valley of the Tisa River. One locality is situated in the valley of the Tisa River near Bečej. The biotope itself represents a littoral zone of the river, which is owergrown by *Amorpha fruticosa* in the frame of *Saliceto-Populetum nigrae,* a component which is situated in a narrow girdle of only 30—150 m between the protective dam and the river. The other locality comprises the periodically inundated territory of the estuary of the Begej into the Tisa River with Carska Bara and several large anthropegenous ponds. The analysed material originates from the pit of Carska bara surrounded by *Saliceto-Populetum nigrae* components, in front of which there is a very developed *Scripo-Phragmitetum* marshy community and a flotant association *Nymphaeetum albo-luteae.*

After having noted the data on localities, the data of catch, and elaborated the host (taxonomic belonging, biometric data, sex and age composition), we have submitted each individual to the parasitological examination by standard method. The search of the host with respect to the infestation by endoparasitic helminths has been performed at the level of lungs, urinary bladder and at some levels of the digestive tract (Gaster, intestinum, rectum).

The collected parasites have been elaborated macrotechnically, and conserved in 70% alcohol, in order to be eleborated and defined microtechnically later on. Permanent preparations have been stained with alaun-carmin and fixed by Canada balsam. The defining has been performed according to the EDELÉNYI key (1974).

The extensity and intensivity of the infestation by indigenous trematodes

The results of the analysis of infestation in general show a high degree of infestation by trematodes (about 3/4 of the examined individuals are invaded), and that almost with the same extensity in both species of hosts (Tab. 1). When analysing the

distribution of parasites according to their localization, it has been stated that trematodes occur mainly in intestinum and lungs, and that in the spacies *R. ridibunda* in a somewhat higher percentage. The extensity of infestation shows a high level of infected condition in both species of hosts — in the case of *R. esculenta* there is in the intestinum a four times greater number, and in *R. ridibunda* a two times greater number of trematodes in relation to the infestation of lungs.

The infestation of the host by trematodes with respect to the intensivity of the invadedness of organs shows a relatively low level of the infestation of lungs in relation to intestinum (Table 1). It may be noticed that the high level of invadedness

Tab. 1. *The locality of invasion of the host with Trematods*

Host	№			Organum														
				Intestinum								Pulmo			Ves. urin.			
	EXP	INF	%	№	%	1—10	11—20	36—45	51—60	71—75		%	1—5	16—10	№	%	1—5	
Rana esculenta	13	10	76,9	8	80,0	2	3	2	1		2	20,0	2		1	10,0	1	
Rana ridibunda	9	7	77,8	6	85,7	1	2		2	1	3	42,8	2	1				

of the intestinum makes its appearance simultaneously with an important intensivity in the category of above 50 percent trematodes per host, and that with a somewhat increased number of individuals in the species *R. ridibunda.*

Eight species of trematodes, out of nine defined species, have been stated in the host *R. esculenta,* and in *R. ridibunda.* It has to be added that liver-flukes *Haematoloechus schulzei* is absent in the species *R. esculenta,* and the liver-fluke *Gorgodera cygnoides* has not been stated in the host *R. ridibunda* (Table 2). The remaining seven

Tab. 2. *The extensity and intensity of the invasion of the host with Trematods*

Trematodes	Rana esculenta								Rana ridibunda								
	Extensity			Intensity					Extensity			Intensity					
	№								№								
	EXP	INF	%	1—5	6—10	11—15	31—35	51—55	EXP	INF	%	1—5	6—10	11—15	16—20	21—25	46—51
1. *Diplodiscus subclavatus*	10	3	30,0	2	1				7	6	85,7	6					
2. *Gorgodera cygnoides*	10	2	20,0	2					7	—							
3. *Haemotolechus variegatus*	10	1	10,0	1					7	2	28,6	2					
4. *Haematoloechus schulzei*	10								7	2	28,6	2					
5. *Opisthyoglyphe ranae*	10	7	70,0	5	1		1		7	3	42,8			1	1		1
6. *Clephalogonimus retusus*	10	6	60,0	2	1	1	1	1	7	6	85,7	3	1			1	1
7. *Pleurogenes claviger*	10	1	10,0	1					7	2	28,6	2					
8. *Pleurogenoides medians*	10	1	10,0	1					7	1	14,3	1					
9. *Prosotocus confusus*	10	1	10,0	1					7	2	28,6		2				

species of trematodes have been found in both examined species of hosts. The liver-flukes and *Opisthyoglyphe ranae* and *Cephalogonimus retusus* in both species of hosts show a high level of the extensity of infestation (from 42.8% to 85.7%), and the species *Diplodiscus subclavatus* is present in the case of *R. ridibunda.*

Faunistic and taxonomic survey of defined species of trematodes

In the two examined species of Anura, 9 species of trematodes (belonging to 5 families) have been stated. It makes the half of the already known 18 species of trematodes in frogs. The following species of trematodes have been determined:

1. *Diplodiscus subclavatus* (PALLAS, 1790), GOEZE, 1782
   Host: *Rana esculenta* L. — discovered in 3 individuals
   Rana ridibunda PALLAS — discovered in 6 individuals
   Locality: Bečej
   Localization: intestinum

2. *Gorgodera cygnoides* ZEDER
   Host: *Rana esculenta* L. — 2 infested individuals
   Locality: Ečka, Bečej
   Localization: vesica urinaria

3. *Haematoloechus variegatus* RUDOLPHI
   Host: *Rana esculenta* L. — 1 infested individual
   Rana ridibunda PALLAS — 2 infested individuals
   Locality: Bečej
   Localization: pulmo

4. *Haematoloechus schulzei* WUNDSCH
   Host: *Rana ridibunda* PALLAS — 2 infested individuals
   Locality: Bečej
   Localization: pulmo

5. *Optisthyoglyphe rane* FRÖHLICH
   Host: *Rana esculenta* L. — 7 infested hosts
   Rana ridibunda PALLAS — 3 infested hosts
   Locality: Bečej
   Localization: instestinum

6. *Cephalogonimus retusus* DUJARDIN
   Host: *Rana esculenta* L. — 6 infested hosts
   Rana ridibunda PALLAS — 6 infested hosts
   Locality: Bečej
   Localization: intestinum

7. *Pleurogenes claviger* RUDOPHI
   Host: *Rana esculenta* L. — infested individual
   Rana ridibunda PALLAS — 2 infested individuals
   Locality: Bečej
   Localization: intestinum

8. *Pleurogenoides medians* OLSSON
Host: *Rana esculenta* L. — 1 infested individual
Rana ridibunda PALLAS — 1 infested individual
Locality: Bečej
Localization: intestinum

9. *Prostocus confusus* LOOSS
Host: *Rana esculenta* L. — 1 infested individual
Rana ridubunda PALLAS — 2 infested individuals
Locality: Bečej
Localization: intestinum

Morphological features of the defined trematodes

1. *Diplodiscus subclavatus*

The lenght of the body is 1.4 mm—3.5 mm, and the width 0.58—1.27 mm. The body is pear-shaped. The abdominal sucker is terminal, very developed. In the middle part of the abdominal sucker, another sucker may be seen. The testis is a little greater than the oral sucker 316,0—647,8×276,5—474,0 μm. The overy is smaller than the testis 110.6—260.7×118.5—244.9 μm. The dimensions of the eggs 86.9—158× ×63.2—86.9 μm.

2. *Gorgodera cygnoides*

The length of the body is 1.8 mm and 5.79 mm, and the width 0.49 mm, 1.22 mm). Oral sucker has smaller dimensions (221.2 μm and 434.5 μm×244.9 μm and 505.6 μm) than the abdominal one (363.4 μm and 948.0 μm×379.2 μm and 897 μm). Testis are not clearly divided in the left and right group (126.4—395.0 μm×189.6—537.2 μm). The dimensions of the ovary are 173.8 μm and 521.4 μm×237.0 μm and 442.4 μm. The eggs are oval: 30.0—36.25×18.75—25.0 μm.

3. *Haematoloechus variegatus*

The length of the body is 5.0—9.0 mm, and the width 0.916—1.659 mm. The surface of the body does not possess any pricks. Oral sucker is subterminal (355.5—655.7×260.7—647.8 μm). The abdominal sucker has smaller dimensions (244.9—308.1×252.8—308.1 μm). The testis are elongated-oval. They are situated on the medial line, one behind the other (T_1=553.0—813.7×450.3—521.4 μm; T_2= =529.3—1.343×347.6—584.6 μm). The dimensions of the ovary: 323.9—884.8× 268.5—790.0 μm, and those of the eggs: 30.0—51.25×15.0—30.0 μm.

4. *Haematoloechus Schulzei*

The lenght of the body is 3.1—5.5 mm, and the width 1.098—1.437 mm. The surface of the body is covered with tiny pricks. The dimensions of the oral sucker: 292.3—418.7×371.3—434.5 μm, and the abdominal sucker 308.1—323.9×308.1—355.5 μm. The first testis 553,0—639.9×371.3—521 μm, and the second testis: 711.0—726.8×276.5—521.4 μm. The ovary (379.2—474.0×237.0—395.0 μm) is situated directly below the abdominal sucker. The dimensions of eggs: 30.0—52.5× 15.0—30.0 μm).

5. *Opisthyoglyphe ranae*

The dimensions of the body are 0.853—1.532×0,331—0.726 mm. The surface of the body is covered by small pricks. Oral sucker is larger (110.6—181.7×118.5—189.0 μm) than the abdominal one (92.5—165.9×96.25—134.3 μm). Testis are situated in the posterior half of the body medially one behind the othher (T_1 = 79.0—158.0×115.0—284.4μm; T_2=79.0—165.9×108.75—276.5 μm). Ovary (75.0—197.5×71.25—173.8 μm) is situated at left side of the body, near the abdominal sucker. The dimensions of the eggs: 36.25—56.25×22.5—35.0 μm.

6. *Cephalogonimus retusus*

The length of the liver-fluke is 1.319—3.500 mm, and the width 0.395—0.853 mm. Tiny pricks cover the surface of the body. Oral sucker (181.7—268.6×181.7—284.4 μm) is larger than adbominal one (122.5—205.4×133.75—229.7 μm). The dimensions of the first testis: 101.25—237.00×112.5—308.1 μm, and the second testis: 110.6—268.6×125.0—252.8 μm. Ovary is situated at the left side of the body (76.25—229.1×66.25—181.7 μm). The eggs: 31.25—65.0×15.0—27.5 μm.

7. *Pleurogenes claviger*

The length of the body is 1.830 mm and 2.725 mm, and the width 0.774 mm, 0.963 mm. Pricks cover the surface of the body. The dimensions of the oral sucker: 205.4× 237.0 μm and 237.0×316.0 μm), and the abdominal one: 150.1×158.0 μm, and 189.6×237.0 μm. The size of the first testis: 244.9×276.5 μm, and 316.0×244.9 μm, and the second: 213.3×237.0 μm; 252.8×284.4 μm. The lenght of the ovary: 237.0 μm and the width 252.8 μm—268.6 μm. The dimensions of the eggs: 27.5—31.25×75—17.5 μm.

8. *Pleurogenoides medians*

The length of the body: 0.671 mm, and the width 0.363 mm. The dimensions have been registerd only in one trematode. The dimensions of oral sucker: 95.0×110.0 μm, and the abdominal one: 97.5×96.25 μm, and 118.5×126.4 μm. The body is covered with tiny pricks. The lenght, and the width of the first testis: 134.3×165.9 μm and 158.0×110.6 μm, and the second testis: 126.4×110.6 μm and 173.8×158.0 μm. The dimensions of the ovary: 107.5×80.0 μm, and 158.0×134.3 μm. The eggs: 15.0—31.25×11.25—16.25 μm.

9. *Prosotocus confusus*

The lenght of the body: 0.813—1.350 mm, and the width 0.513—0.861 mm. Tiny pricks cover the surface of the body. Oral sucker is larger (142.2—237.0×165.9—221.2×112.5—237.0 μm). The dimension of the right testis: 110.6—237.0×158.0—237.0 μm; that of the left one: 134.3—221.2×158.0—252.8 μm. The length of the ovary: 134.3—221.2 μm and the width 158.0—237.0 μm. The dimensions of the eggs: 17.5—30.0×10.0—15.0 μm.

Conclusion

The parasitological examination of two species of hosts of the genus Rana *(R. esculenta* and *R. ridibunda)* from the valley of the river Tisa, with respect to the infestation by trematodes, has given the following results:

— The presence of nine species of parasites, belonging to five families of trematodes has been stated, what makes the half of the already known species of trematodes in Anura. Two of them

— *Haematoloechus schulzei* is absent in the host *R. esculenta,* and the trematode *Gorgodera cygnoides* has not been stated in the species *R. ridibunda* (Table 2).

— First of all, trematodes appear in the intestinum and lungs of the host. As to their distribution in hosts, in the intestinum of *R. esculenta* a four times greater number of trematodes has been stated, while in the lungs of *R. ridibunda* a two times greater number of trematodes has been found.

— Simultaneously with the high level of infestation there appears a significant intensivity in the category above 50 percent trematiodes per host, and that with a somewhat higher number of individuals in the species *R. ridibunda* (Tab. 2).

— The extensity of invadedness of hosts by trematodes is significant. In both species of hosts about 3/4 of examined individuals are infested (Table 1). A high degree of invadedness wiht *Opisthyoglyphe ranae* (42.8%) and *Cephalogonimus retusus* has been stated in both species of hosts and with *Diplodiscus subclavatus* (85.7%) in the case of the species *R. ridibunda* (Tab. 2).

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A Tiszavölgy Rana (Amphibia) békáinak Trematoda fertőzöttsége (Yugoslavia)

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Kivonat

A Tiszavölgy Becse és Écska térségéről gyűjtött Rana nemhez tartozó 13 *Rana esculenta* és 9 *Rana ridibunda* helmintológiai vizsgálatát végezték el a szerzők. Megállapítást nyert, hogy a gazdaállatok egyedeinek fertőzöttségi extenzitása, mindkét békafaj esetében, többé-kevésbé egyenletes (77,8% és 76,9%). Ugyanakkor a tavi béka fertőzöttségi intenzitása elenyészően nagyobb. Összesen 9 Trematoda faj került elő: *Diplodiscus subclavatus* GOETE, *Haematoloechus (Pneumonoeces) variegatus* RUDOLPHI, *Hematoloechus (Pneumonoeces) schulzei* WUNDSCH, *Opisthyoglyphe ranae* FRÖLICH, *Gorgodera cygnoides* ZEDER, *Cephalogonimus retusus* DUJARDIN, *Pleurogenes claviger* RUDOLPHI, *Pleurogenoides medians* OLSSON és *Prosotocus confusus* LOOSS.

Инфестированность безхвостых земноводных рода (Amphibia: Anurat) в долине реки Тиса

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Резюме

На участке реки Тиса, в районе г. Бечей и м. эчка, выполнены паразитологические испытания 13 экземпляров породы *Rana esculenta* и 9 экземпляров породы *Rana ridibunda*. Установлена была почти идентичная экстенсивность инвадированности подвергаемых анализу примеров обоих пород лягушек (77,8%, т.е. 76,9%), в то время как у экземпляров пород *R. ridibunda* обнаружена увеличенная интенсивность зараженности. Установлено было 9 пород Trematoda: *Diplodiscus subclavatus* GOETE, *Gorgodera cygnoides* ZEDER, *Haematoloechus (Pneumonoeces) variegatus* Rudolphi *Haematoloechus (P.) schulzei* WUNDSCH, *Opisthyoglyphe ranae* FRÖLICH, *Cephalogonimus retusus* DUJARDIN, *Pleurogenoides medians* OLSSON, *Prosotocus confusus* LOOSS и *Pleurogenes claviger* RUDOLPHI.

Infestiranost bezrepih vodozemaca roda Rana (Amphibia: Anura) u dolini reke Tise

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Izvod

Na deonici reke Tise, sa područja Bečeja i Ečke, invršena je parazitološka pretraga 13 domaćina vrste *Rana esculenta* i 9 jedinki vrste *Rana ridibunda*. Ustanovljen je skoro istovetan ekstenzitet invadiranosti kod analiziranih jedinki obe vrste žabe (77,8% odnosno 76,9%), dok su primerci vrste *R. ridibunda* imala veći intenzitet zaraženosti. Determinisano je 9 vrsta *Trematoda: Diplodiscus subclavatus* GOETE, *Gorgodera cygnoides* ZEDER, *Haematoloechus (Pneumonoeces) variegatus* RUDOLPHI, *Haematoloechus (P.) schulzei* WUNDSCH, *Opisthyoglyphe ranea* FRÖLICH, *Cephalogonimus retusus* DUJARDIN, *Pleurogenoides medians* OLSSON i *Prosotocus confusus* LOOSS, i *Pleurogenes claviger* RUDOLPHI.